

## Chemical Stabilization (CHS)



Photo courtesy of Sunshine Supplies, Inc.

### Practice Description

Chemical Stabilization erosion control involves the use of products, including soil binders that help to hold the soil in place, thereby reducing soil particle detachment and short-term erosion caused by water and wind. Water-soluble polyacrylamide (PAM) is often used for this purpose. Other products may also provide this benefit. The products are typically applied with temporary seeding and or mulching on areas where the timely establishment of temporary erosion control is so critical that seedings and mulching need additional reinforcement.

### Typical Components of the Practice

- Site Preparation
- Equipment Preparation
- Chemical Application
- Installation Verification

## **Application**

Prior to the start of construction, the application of chemicals for surface stabilization should be designed by a qualified design professional and plans and specifications should be available to field personnel.

The application should conform to the design and specifications provided in the plans.

### ***Site Preparation***

Prepare site following design and specifications.

### ***Equipment Preparation***

When using chemicals that can clog a liquid application system, pump a surfactant through the injection system before and after injecting concentrated chemicals into the sprinkler irrigation system to prevent valves and tubing from clogging.

Chemicals used in hydroseeding applications should be the last additive to the mix.

After use, rinse all mixing and application equipment thoroughly with water to avoid formation of residues. Rinse residue should be applied to soil areas needing stabilization.

### ***Chemical Application***

Site testing for a product should be conducted before application to verify the product performance. Test reports (recommendations) should be supplied to the design professional and contractor before product application.

Toxicity reports should be provided by the supplier to the contractor before application of a product (this is to assure that applications from the recommended product will be non-toxic).

Chemicals should be mixed and/or applied in accordance with all Occupational Safety and Health Administration (OSHA) Material Safety Data Sheet requirements and the manufacturer's recommendations for the specified use conforming to all federal, state and local laws, rules and regulations.

Emulsion batches should be mixed following recommendations of a testing laboratory that determines the proper product and rate to meet site requirements.

Never add water to chemicals, but instead add the chemical slowly to water.

Dry form (powder) may be applied by hand spreader or a mechanical spreader.

Mixing with dry silica sand will aid in spreading. Pre-mixing of dry form chemicals into fertilizer, seed or other soil amendments is allowed when specified in the design plan. Application method should ensure uniform coverage to the target area.

If near a water body, observe the identified Buffer Zone for the job.

### ***Installation Verification***

Check all components of the practice during installation to ensure that specifications are being met.

## **Common Problems**

*Consult with a qualified design professional if any of the following occur:*

- Problems with application equipment clogging.
- Application specifications for chemicals cannot be met; alternatives may be required. Unapproved application techniques could lead to failure.
- Visible erosion occurs after application.

## **Maintenance**

An operation and maintenance plan must be prepared for use by the operator responsible for chemical application. Plan items should include the following items:

- Reapply chemicals to disturbed or tilled areas that require continued erosion control.
- Maintain equipment to provide uniform application rates.
- Rinse all mixing and application equipment thoroughly with water to avoid formation of residues and discharge rinse water to soil areas where stabilization may be helpful.
- Down gradient deposition from the use of chemicals may require periodic sediment removal to maintain normal functions of sediment control practices.

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## Dune Sand Fence (DSF)



Photo courtesy of Alabama Department of Environmental Management

### Practice Description

A dune sand fence is a temporary barrier consisting of wooden slots installed across a dune landscape perpendicular to the prevailing wind. Dune sand fence reduces wind velocity at the ground surface and traps blowing sand. Sand fencing and appropriate plant materials can be used to build frontal ocean dunes to control beach erosion and flooding behind frontal dunes from wave overwash. Sand fence is applicable where sand can be trapped to enhance dune vegetation.

### Typical Components of the Practice

- Scheduling
- Site Preparation
- Installation
- Construction Verification

*Note: To attain maximum benefits of a dune sand fence, the beach/dune area designated for sand trapping should be renourished with appropriate plantings before the installation of the dune sand fence (in the absence of a dune vegetation planting plan, see Dune Vegetation Planting for guidance).*

## **Construction**

Prior to start of construction, sand fence should be designed by a qualified design professional and necessary federal, state and local permits should be obtained. Plans and specifications should be referred to by field personnel throughout the construction process.

Attempt to schedule the installation of dune sand fence during the recommended planting periods for the associated dune vegetation plantings that are planned.

### ***Site Preparation***

Determine if underground utilities exist in the area and if they do, determine their locations so that fence lines and placement of stakes can be selected where utilities will not be damaged.

Remove any obstacles that will prevent installation of the fence.

### ***Installation***

Install the fence according to details in the design plan. If design details are not available guidelines should be obtained from the Alabama Department of Environmental Management Coastal Zone Program office or the following items should be considered for guidance.

Establish the position for the sand fence: (a) a minimum of 100 feet (horizontal) from the MHT (mean high tide) line with 2 parallel rows of fence approximately 30 feet apart. The row alignment should be roughly parallel to the water line, yet as close as possible to a right angle to the prevailing winds. Figure DSF-1 shows a plan view of a conceptual erosion and sediment control system with the Dune Sand Fence configured to minimize adverse impacts to nesting endangered sea turtles.

Install posts a minimum of 3 feet deep and 10 feet apart. Do not concrete in place.

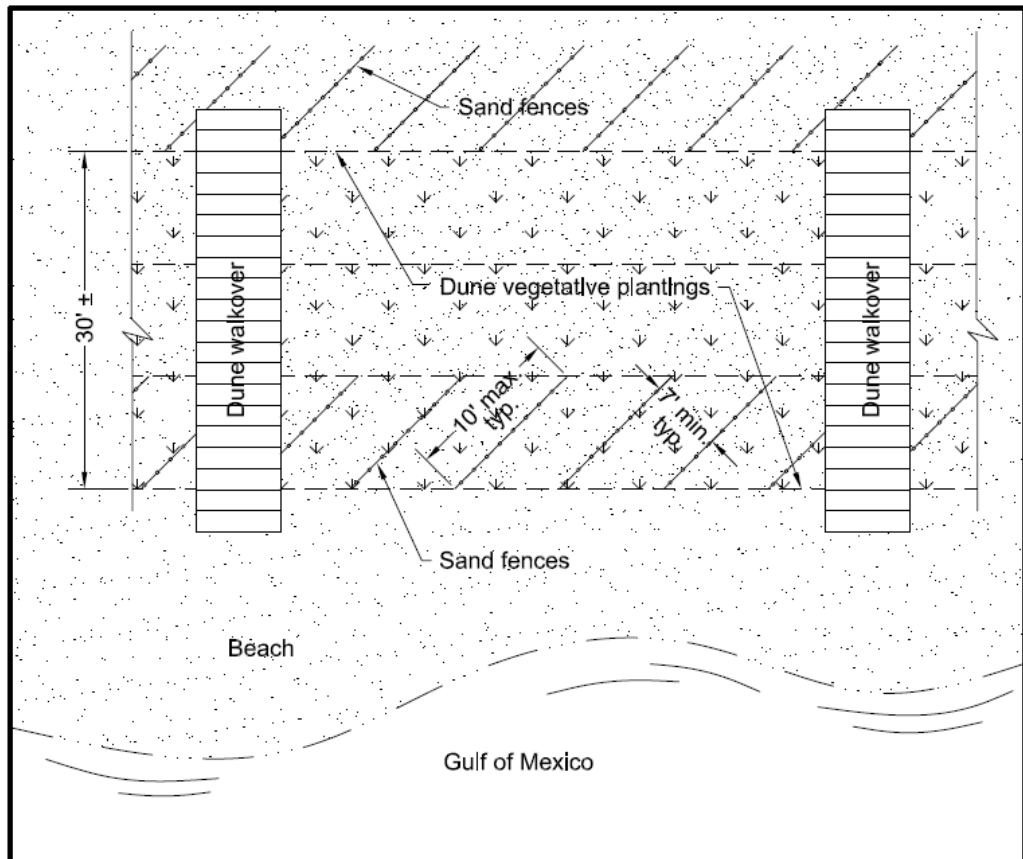
Use 4 galvanized wire ties to fasten the fence to the wood posts. Weave the fence between posts so that every other post will have fencing on the ocean side of posts.

If widening an old dune, the new fence should be set seaward 15 feet from its current base.

### Construction Verification

Check materials for compliance with specifications.

Figure DSF-1 Typical Dune Sand Fence



### Common Problems

*Consult with a qualified design professional if any of the following occur:*

- Variations in topography on site indicate dune sand fence will not function as intended; changes in plan may be needed.
- Design specifications for materials cannot be met; substitutions may be required. Unapproved substitutions could lead to failure.

## **Maintenance**

Inspect dune sand fences monthly and after each significant event with high winds and waves. Make required repairs immediately if fence is damaged by high wind or water.

As the fences fill with sand, additional sets of fence can be placed over those almost filled until the barrier dune has reached a protective height. To widen an old dune, fencing should be set seaward at a distance of 15 feet from its base.



## Dune Vegetation Planting (DVP)



Photo courtesy of Alabama Department of Environmental Management

### Practice Description

Dune vegetation planting is the establishment of perennial vegetation on dunes from seed or vegetative material. Perennial dune vegetation provides economical long-term erosion control and helps prevent sediment from leaving the site. This practice is used where vegetation is desired and appropriate to permanently stabilize the dune. Additional measures, such as crosswalks and barriers, are often needed to develop successful establishment of the vegetation.

### Typical Components of the Practice

- Scheduling
- Site Preparation
- Fertilizing
- Planting
- Irrigation
- Inspection

### Installation

Prior to start of construction, details of the planting (species, rates, planting dates, etc.) should be specified by a qualified design professional. Plans and

specifications should be referred to by field personnel throughout the installation process.

### ***Scheduling***

The schedule for work at the site should consider the recommended planting period and whenever practical the site work should accommodate planting during the recommended planting period.

### ***Site Preparation***

Construction of crosswalks and installation of sand fence, or other barriers, should be coordinated with the planting according to the design plan.

Seedbed preparation typical for non-dune plantings is not normally done.

### ***Fertilizing***

Fertilizer may be applied either before or after the planting, depending upon the specifications in the design plan. Apply fertilizer at rates specified in the design plan or as recommended by soil tests. In the absence of a design plan, use the following as a guide:

Evenly spread 13-13-13 at the rate of 200-300 lbs/ac (4.6 to 6.9 lbs /1000 ft<sup>2</sup>) either before or within 6 weeks after planting.

*Note: Fertilizer can be blended to meet exact fertilizer recommendations and spread by a vendor. This may be more economical than spreading bagged fertilizer.*

### ***Planting***

Plant the species specified in the plan at the rate and depth specified in the planting plan. In the absence of a plan consider the following guidelines.

## Seed

Select adapted species from Table DVP-1.

Apply seed uniformly using a cyclone seeder or drop-type spreader.

When planting by methods other than a drill seeder, cover seed by raking, or dragging a chain, brush or mat.

Table DVP-1 Commonly Used Plants for Dune Stabilization

Species	Plant Spacing	Planting Period	Method
<b>Sea Oats</b> <b>Uniola paniculata</b>	12 – 36"	March – June	Potted plants
<b>Atlantic Coastal Panigrass</b> <b>(Panicum amarum var-amarulum)</b>	12 – 36"	March – June	Seed or sprigs
<b>Flageo Marshhay Cordgrass</b> <b>(Spartina patens)</b>	12 – 24"	March – June	Sprigs
<b>Sharpe Marshhay Cordgrass</b> <b>(Spartina patens)</b>	12 – 24"	March – June	Sprigs
<b>North PA Bitter Panicum</b> <b>(Panicum amarum)</b>	24 – 36"	March – June	Potted plants or bare root plugs
<b>South PA Bitter Panicum</b> <b>(Panicum amarum)</b>	24 – 36"	March – June	Potted plants or bare root plugs

## Vegetative Material

Select adapted species from Table DVP-1.

Plant the species specified in the plan at the rate and depth specified. In the absence of a plan consider the following guidelines.

Plant vegetative material 6" to 10" or deep enough to have adequate soil moisture at the time of planting.

Herbaceous plant spacing ranges from 1 to 3 feet, but is typically 18" for 1" to 4" potted stock or bare root plugs of the same diameter.

## Irrigation

Apply irrigation as specified in the planting plan.

## Installation Verification

Check materials and installation for compliance with specifications during installation of products.

## Common Problems

*Consult with a qualified design professional if the following occurs. Design specifications for plant species or planting dates cannot be met; substitutions may be required. Unapproved substitutions could lead to failure.*

- Planting at the wrong time of the year results in an inadequate stand. Replant according to specifications of a qualified design professional (see recommendations under Maintenance)

## Maintenance

Inspect plantings monthly for stand survival and vigor. Generally, a stand of vegetation cannot be determined to be fully established until vegetative cover has been maintained for 1 year from planting.

### **Replanting**

Stand conditions, particularly the coverage, will determine the extent of remedial actions. A qualified design professional should be consulted to advise on remedial actions.

### **Fertilizing**

Apply fertilizer at rates specified in the design plan or as recommended by soil tests. In the absence of a design plan, follow soil test recommendations or apply 13-13-13 at the rate of 400 lbs/acre annually (approximately 9 lbs/1000 ft<sup>2</sup>) during the growing season before September.

Fertilization is recommended until the plants spread to provide complete cover and after storms damage stands.

## Dune Walkover (DW)



Photo courtesy of Alabama Department of Environmental Management Coastal Programs Office

### Practice Description

A dune walkover is a measure consisting of elevated walks that are constructed across the dune system. It provides pedestrian access to the beach area and protects the dunes from erosion. It is applicable on sparsely vegetated dunes where pedestrian access adversely impacts the vegetation and on dunes with adequate vegetation where pedestrian access is planned and vegetation is needed to protect the dunes from erosion.

### Typical Components of the Practice

- Scheduling
- Site Preparation
- Installation and Removal
- Erosion Control
- Safety
- Construction Verification

## **Construction**

Prior to start of construction, a dune walkover should be designed by a qualified design professional and necessary federal, state and local reviews and permits should be obtained. Plans and specifications should be referred to by field personnel throughout the construction process.

### ***Scheduling***

Attempt to construct dune walkover during the recommended planting periods for the associated dune vegetation plantings that are planned.

### ***Site Preparation***

Ensure that all necessary materials are on the site before any work begins.

### ***Installation***

Install the structure according to the design plan.

### ***Erosion Control***

Minimize the size of all disturbed areas and vegetate as soon as each phase of construction is complete. Establish vegetation on all renourished disturbed areas in accordance with the design plan.

If a planting plan is not available, refer to the Dune Vegetation Planting practice and Figure DW -1 for guidance.

### ***Safety***

Equipment used in construction should be free of leaks of fuel and hydraulic fluids.

Install fencing and post warning signs if trespassing is likely during construction.

### ***Construction Verification***

Check to determine that materials and construction meet plan specifications.

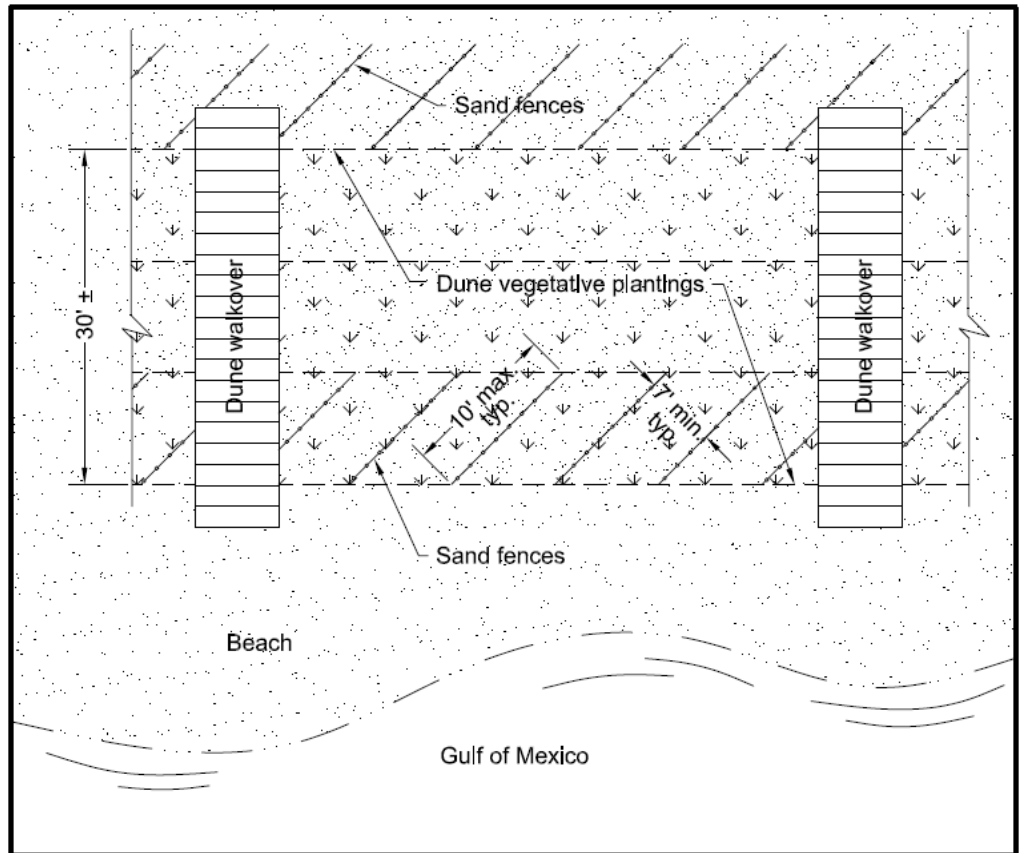


Figure DW-1 Typical Dune Walkover System

## Common Problems

*Consult with qualified design professional if any of the following occur:*

- Variations in topography on site indicate dune walkover will not function as intended; changes in plan may be needed.
- Design specifications for materials cannot be met; substitution may be required. Unapproved substitutions could result in the crossing being washed out.

## Maintenance

Inspect the dune walkover for damage to the structure after each major storm event.

Repair any damages to structural measures found during inspections. Replant materials that have been destroyed by high tides and major hurricanes.

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## Dust Control (DC)



### Practice Description

Dust control includes a wide range of techniques that prevent or reduce movement of wind-borne soil particles (dust) during land disturbing activities. This practice applies to construction routes and other disturbed areas where on-site and off-site damage or hazards may occur if dust is not controlled.

### Typical Components of the Practice

- Scheduling
- Erosion Control
- Other Potential Components
  - Sprinkling
  - Barriers
  - Spray-on Adhesives
  - Stone
  - Street Cleaning
- Installation Verification

## **Construction**

Dust control requirements should be designed by a qualified design professional and plans and specifications should be made available to field personnel prior to start of construction. Whenever possible, leave undisturbed vegetated buffer areas between graded areas.

### ***Scheduling***

Schedule construction operations so that the smallest area is disturbed at any one time.

### ***Erosion Control***

Install surface stabilization measures (vegetative cover or mulch) immediately after completing the land grading.

### ***Vegetative Cover***

See Temporary or Permanent Seeding practice for guidance. Vegetation provides the most practical method of dust control for areas not subject to traffic.

### ***Mulching***

See Mulching practice for guidance on applying mulch and tackifiers or binders. Mulching is not recommended for areas with heavy traffic.

### ***Sprinkling***

Sprinkle the site with water until the surface is moist. This practice is effective for dust control on haul roads or other traffic routes, but constant repetition is required for effective control.

### ***Barriers***

Install board fences perpendicular to the prevailing winds at intervals (distance) of 15 times the barrier height.

### ***Calcium Chloride***

Apply with a mechanical spreader at a rate that keeps the surface moist.

*Consult with a qualified design professional to determine if a permit is required.*

### **Spray-on Adhesives**

Spray adhesives according to the design plan.

*Consult with a qualified design professional if spray-on adhesives are specified.  
A permit may be needed.*

In the absence of a detailed plan, use manufacturers' recommendations. Table DC-1 presents examples of spray-on adhesives that have been used successfully for dust control.

Table DC-1 Application Rates for Spray-on Adhesives Used in Dust Control

Adhesive	Water Dilution (adhesive: water)	Type of Nozzle	Application Rate (gallons/acre)
Anionic Asphalt Emulsion	7:1	Coarse	1200
Latex Emulsion	12.5:1	Fine	235
Resin in Water	4:1	Fine	300
Acrylic Emulsion (Non-traffic)	7:1	Coarse	450
Non-Acrylic Emulsion (Traffic)	3.5:1	Coarse	350

Source: Virginia Erosion and Sediment Control Handbook, 1993

*Consult with a qualified design professional if spray-on adhesives are specified.  
A permit may be needed.*

### **Stone**

Stone should be placed to the width and thickness specified in the design.

### **Street Cleaning**

Use a street sweeper to remove the source materials.

### **Construction Verification**

Check installation of product(s) to verify use of proper product and quantity.

### **Common Problems**

Drought conditions result in dry soils and increase in dust problems—use greater precautions during these periods.

## **Maintenance**

Check construction site during vehicular traffic or windy conditions to see if measures are working adequately. Maintain dust control measures continuously throughout dry weather periods, until all disturbed areas have been stabilized.

## Erosion Control Blanket (ECB)



Photo courtesy of Environmental Plans and Review Section, Development Department, DeKalb County, GA

### Practice Description

To aid in controlling erosion on critical areas by providing a protective cover made of straw, jute, wood or other plant fibers; plastic, nylon, paper or cotton. This practice is best utilized on slopes and channels where the erosion hazard is high, and plant growth is likely to be too slow to provide adequate protective cover. Erosion control blankets are typically used as an alternative to mulching but can also be used to provide structural erosion protection. Some important factors in the choice of a blanket are: soil conditions, steepness of slope, length of slope, type and duration of protection required to establish desired vegetation, and probable shear stress.

### Typical Components of the Practice

- Site Preparation
- Erosion Control Planting
- Blanket Installation
- Construction Verification

## Construction

*Prior to the start of construction, the application of erosion control blankets should be designed by a qualified design professional and plans and specifications should be available to field personnel.*

Numerous products designed to control erosion are available. Product installation procedures for manufactured erosion control blanket products should always be available from the manufacturer. Table ECB-1 lists some of the more common products available.

Table ECB-1 Types of Erosion Control Blankets

Type of Erosion Control	Main Use	Comments
<b>Netting</b>	Synthetic or natural fiber mesh installed over disturbed area to hold organic mulch and/or seed in place.	Provides minimal structural erosion resistance. Mulch applied using standard procedures.
<b>Biodegradable Erosion Control Blanket</b>	Natural fiber blanket held together by netting to provide temporary erosion protection on slopes up to 1:1; and channels with permissible shear stress up to 4 lbs./ft.	Provides 1- to 5-year protection from erosion. Metal staples used as anchors.
<b>Permanent Erosion Control Blanket</b>	Synthetic blanket material which provides permanent erosion control on slopes up to 1:1; channels with increased water flow velocities and increased shear stress.	Provides minimal protection from wave action around ponds and lakes. Permanent erosion control blankets extend the limits of vegetation. Metal staples used as anchors.
<b>Turf Reinforcement Mat</b>	3-dimensional permanent synthetic mat that provides a matrix to greatly reinforce the root system of the desired vegetation for permanent erosion protection in high flow channels and on critical slopes.	Provides a substantial increase in erosion resistance. May provide erosion protection equivalent to stone or concrete liners.

The field inspector should verify that installation is in accordance with the plans and specifications.

### Site Preparation

Grade the site in accordance with the approved design to a smooth and uniform surface, free of debris.

Add and incorporate topsoil where needed.

Make sure seedbed is firm yet friable.

### ***Erosion Control Planting***

Spread and incorporate lime and fertilizer as described in the design plan.

Spread seed and incorporate as described in the planting specifications.

### ***Blanket Installation***

Erosion control blanket products should be installed in accordance with the manufacturer's recommendations and specifications, including check slots and stapling materials.

Anchor product so that a continuous, firm contact (no tenting) with the soil surface/seed bed is maintained. This is best accomplished on slopes by working from the bottom to the top.

### ***Construction Verification***

Check finished grade, dimensions and staple spacing of erosion control blankets. Check materials for compliance with specifications.

## **Common Problems**

*Consult with a qualified design professional if any of the following occur:*

- Movement of the blanket or erosion under the blanket is observed.
- Poor contact between the soil and the erosion control blanket results in surface water flowing under rather than over the blanket, causing erosion; retrench or reanchor to direct water over blanket.
- Blanket inadequately or improperly stapled results in tenting, blanket movement or displacement; reinstall and ensure blanket is properly anchored.
- Unstable slope results in blanket or slope failure; determine cause of slope failure, stabilize slope and reinstall blanket.
- Variations in topography on site indicate erosion control mat will not function as intended; changes in plan may be needed, or a blanket with a shorter or longer life may be needed.
- Design specifications for seed variety, seeding dates or erosion control materials cannot be met; substitution may be required. Unapproved substitutions could result in failure to establish vegetation or breach of contract.

## **Maintenance**

Inspect after storm events until vegetation is established for erosion or undermining beneath the blankets. If any area shows erosion, pull back that portion of the blanket, add tamped soil and reseed; then resecure the blankets.

If blankets should become dislocated or damaged, repair or replace and resecure immediately.



## Groundskeeping (GK)



### Practice Description

Groundskeeping or “good housekeeping” describes the various activities and measures, in addition to the specific practices used for erosion and sediment control that are essential during construction for the protection of environmental quality. Groundskeeping is applicable at all construction sites.

### Typical Components of the Practice

Prior to the start of construction, Groundskeeping activities and measures should be identified by a qualified design professional and included in the construction and pollution prevention plan. The essential components of Groundskeeping should be provided to the prime contractor for a project. Groundskeeping activities and measures essential at construction sites vary based on the complexity of the site and the project. Groundskeeping typically includes the following activities and measures:

- Inspections During Construction/Installation of Erosion and Sediment Control and Stormwater Measures (BMPS)
- Spill Prevention and Material Management
- Spill Controls

- Other Potential Activities and Measures (examples: removal of contaminated soils, management of hazardous products, protection of air quality, etc.)

## **Details about Components**

### ***Inspections of BMPs***

Inspections should be made regularly and timely to ensure that erosion and sediment control and stormwater management practices are performing as planned and whether or not maintenance is needed. In addition, inspections and reports should meet local and state requirements.

### ***Spill Prevention and Material Management***

Alabama Department Environmental Management (ADEM) regulations require that an operator/owner implement a Spill Prevention Control and Counter Measures (SPCC) Plan for all temporary and permanent onsite fuel or chemical storage tanks or facilities to address the safe storage, handling and cleanup of petroleum products and other chemicals.

All vehicles kept on the site need to be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage.

If petroleum products are stored on site, a secondary containment facility will be required if the cumulative storage capacity of all tanks, greater than 55 gallons, at the site exceeds 1,320 gallons. The secondary containment facility must be designed by a qualified design professional.

Petroleum products should be stored in labeled tightly sealed containers.

Any asphalt substances used on-site should be applied according to the manufacturer's recommendations.

No fueling, servicing, maintenance, or repair of equipment or machinery should be done within 50 feet of a stream, or within 100 feet of a stream classified for public water supply (PWS) or Outstanding Alabama Water (OAW), or designated as an Outstanding National Resource Water (ONRW) or a sinkhole.

Only designated entrances should be used for construction access to the site. Mud tracked from the site onto streets and roads should be cleaned on a daily basis if needed.

Concrete trucks should be allowed to wash only in locations where discharge is appropriately treated to meet applicable regulatory requirements. It is not permissible to discharge concrete wash directly to streams or storm drains. Concrete wash can contain sediment, as well as, alkalinity and chemical additives that could be harmful to fish, stream bottom macroinvertebrates and wildlife.

No fuels, oils, lubricants, solvents, or other hazardous materials can be disposed of on the site. All hazardous material must be properly disposed of in accordance with state law.

Solid waste should be disposed of in accordance with state law. Dumpsters or other collection facilities must be provided as needed.

Portable toilets should be located so that accidental spills will not discharge into a storm sewer or concentrated flow area.

Water for pressure testing sanitary sewers, flushing water lines, etc., may be discharged only in approved areas and to prevent discharging to surface waters. Discharge of hydrostatic test water may require additional permitting, particularly if chlorinated public water is used.

### ***Spill Controls***

The operator/owner is expected to maintain on-site or have readily available sufficient oil & grease absorbing material and flotation booms to contain and clean-up fuel or chemical spills and leaks.

Equipment and materials include, but are not limited to brooms, dust pans, mops, rags, gloves, goggles, absorbent clay, sand, sawdust, and plastic and metal trash containers specifically for this purpose.

Spills of toxic or hazardous material must be reported immediately. The operator/owner is required to immediately notify ADEM after becoming aware of a significant spill/leak or visible oil sheen in the vicinity of the construction activity. In the event of a spill with the potential to impact groundwater or other waters of the State, the operator/owner is expected to immediately call the National Response Center (NRC) at 1-800-424-8802 and the Alabama Emergency Management Agency (AEMA) at 1-800-843-0699. The caller should be prepared to report the name, address and telephone number of person reporting spill, the exact location of the spill, the company name and location, the material spilled, the estimated quantity, the source of spill, the cause of the spill, the nearest downstream water with the potential to receive the spill, and the actions taken for containment and cleanup.

All spills need to be cleaned up immediately after discovery and properly containerized for proper disposal. Refer to Material Safety Data Sheets for safe handling procedures. Burial is not acceptable.

The spill area must be kept well ventilated and personnel need to wear appropriate protective clothing to prevent injury from contact with a hazardous substance.

The spill prevention plan needs to be adjusted to include measures to prevent any spill from being repeated, and the plan needs to show how to clean up the spill if another one does occur.

### ***Removal of Contaminated Soils and Underground Storage Tanks***

Site assessment and removal of contaminated soils and underground storage tanks should be done following a site assessment based on procedures provided by the Alabama Department of Environmental Management.

### ***Management of Hazardous Products***

Products must be kept in original containers unless they are not resealable. If a product is transferred to a new container, it must be properly marked and labeled.

Original labels and Material Safety Data Sheets should be retained until the related product is no longer on the site.

If surplus product must be disposed of, disposal must be done in accordance with state (Alabama Department of Environmental Management regulations).

### ***Protection of Air Quality***

#### **Smoke**

Burning on the site may require a permit from the Alabama Forestry Commission. County and city ordinances may also apply. Starting disposal fires with diesel fuel, petroleum products, or old tires is not a recommended practice. Burn pits with fans to generate hot disposal fires decreases the fire time and minimizes smoke. Burning may be prohibited by State “burn bans” to reduce potential for ground-level ozone.

#### **Dust**

Dust should be controlled if it will create a problem either on or off of the site. If measures are not included in the site design plan see the practice Dust Control for potential measures to use to eliminate or minimize dust.

### ***Other Good Groundskeeping Practices***

*The following measures may be needed:*

- All materials stored on-site should be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products should be kept tightly sealed in their original containers with the original manufacturer's label.
- Whenever possible, all of a product should be used up before disposing of the container.
- Manufacturer's recommendations for proper use and disposal must be followed. See Material Safety Data Sheets for product of concern.
- The site superintendent or a designated employee should inspect daily to ensure proper usage, storage and disposal of material

## Mulching (MU)



### Practice Description

Mulching is the application of plant residues such as straw or other suitable fibrous materials to the soil surface. Mulch protects the soil surface from the erosive force of raindrop impact and reduces the velocity of overland flow. It helps seedlings germinate and grow by conserving moisture, protecting against temperature extremes and controlling weeds. Mulch also maintains the infiltration capacity of the soil. Mulch can be applied to seeded areas to help establish plant cover. It can also be used in unseeded areas to protect against erosion over the winter or until final grading and shaping can be accomplished except in areas of concentrated flow.

### Typical Components of the Practice

- Site Preparation
- Application of Material
- Verification of Installation

### Installation

Mulching should be designed by a qualified design professional and plans and specifications should be made available to field personnel prior to start of construction.

### ***Site Preparation***

Divert runoff water from areas above the site that will be mulched.

Remove stumps, roots and other debris from the construction area.

Grade area as needed to permit the use of equipment for seeding, mulching and maintenance. Shape area so that it is relatively smooth.

If the area will be seeded, follow seeding specifications in the design plan and apply mulch immediately after seeding.

### ***Application of Material***

Spread straw mulch, preferably cereal grain, uniformly over the area with a power blower, hydroseeder or by hand. Mulch should be uniformly spread and not clumped in piles. In a seeded area, about 25% of the ground surface should be visible after mulching. It is important when mulching a seeded area that an excessive quantity of straw is not applied – too much mulch will retard or reduce the future stand. When mulch is used for erosion control without seeding, 100% of the soil surface should be covered.

Hydraulic Erosion Control Products (HECPs) as defined by the Erosion Control Technology Council (ECTC) are also used for mulch and should be applied with the appropriate equipment and at the recommended or specified rates.

Apply mulches at the rates shown in the plan or in Table MU-1 if there is not a plan.

Anchor straw or wood cellulose mulch by one of the following methods:

- Crimp with a mulch anchoring tool, as near on the contour as practical, to punch the straw into the soil.
- Tack with a liquid tackifier designed to hold mulch in place. Use suitable spray equipment and follow manufacturer's recommendations.
- In more erosive areas, cover with netting, using a degradable natural or synthetic mesh. The netting should be anchored according to manufacturer's specifications (see Erosion Control Blanket practice).
- On steep slopes and other areas needing a higher degree of protection, use heavy natural nets without additional mulch, synthetic netting with additional mulch or erosion control mats/blankets. These areas include grassed waterways, swales and diversion channels.
- Install netting and mats/blankets according to manufacturer's specifications making sure materials are properly anchored (see Erosion Control Blanket).

Table MU-1 Mulching Materials and Application Rates

Material	Rate Per Acre and (Per 1000 ft. <sup>2</sup> )	Notes
<b>Straw (with Seed)</b>	1 ½ - 2 tons (70 lbs - 90 lbs)	Spread by hand or machine; anchor when subject to blowing.
<b>Straw Alone (no seed)</b>	2 ½ - 3 tons (115 lbs - 160 lbs)	Spread by hand or machine; anchor when subject to blowing.
<b>Wood Chips</b>	5-6 tons (225 lbs - 270 lbs)	Treat with 12 lbs. nitrogen/ton.
<b>Bark</b>	35 cubic yards (0.8 cubic yard)	Can apply with mulch blower.
<b>Pine Straw</b>	1-2 tons (45 lbs - 90 lbs)	Spread by hand or machine; will not blow like straw.
<b>Peanut Hulls</b>	10-20 tons (450 lbs - 900 lbs)	Will wash off slopes. Treat with 12 lbs. nitrogen/ton.
<b>HECPs</b>	0.75 – 2.25 tons (35 lbs – 103 lbs)	Refer to ECTC or Manufacturer's Specifications.

### ***Verification of Installation***

Check materials and installation for compliance with specifications.

## **Common Problems**

*Consult with qualified design professional if either of the following occurs:*

- Variations in topography on site indicate the mulching materials will not function as intended; changes in plan may be needed.
- Design specifications for mulching materials or seeding requirements cannot be met; substitution may be required. Unapproved substitutions could result in erosion or seeding failure.

*Problems that require remedial actions:*

- Erosion, washout and poor plant establishment; repair eroded surface, reseed, remulch and anchor mulch.
- Mulch is lost to wind or stormwater runoff; reapply mulch and anchor appropriately by crimping, netting or tacking.



## **Maintenance**

Inspect all mulched areas periodically and after rainstorms for erosion and damage to the mulch. Repair promptly and restore to original condition. Continue inspections until vegetation is well established. Keep mower height high if plastic netting is used to prevent netting from wrapping around mower blades or shaft.



## Permanent Seeding (PS)



### Practice Description

Permanent seeding is the establishment of perennial vegetation on disturbed areas from seed. Permanent vegetation provides economical long-term erosion control and helps prevent sediment from leaving the site. This practice is used when vegetation is desired and appropriate to permanently stabilize the soil.

### Typical Components of the Practice

- Scheduling
- Seedbed Preparation
- Applying Soil Amendments (lime and fertilizer)
- Planting
- Mulching or Installation of Erosion Control Blanket
- Inspection

### Installation

Prior to start of construction, plant materials, seeding rates and planting dates should be specified by a qualified design professional. Plans and specifications should be referred to by field personnel throughout the installation process.

Permanent seeding should be made during the specified planting period whenever possible. When sites are only available for planting outside of the recommended planting period, either an out-of-season permanent seeding, a temporary seeding, mulching or chemical stabilization should be applied. If lime and fertilizer application rates are not specified, take soil samples during final grading from the top 6" in each area to be seeded. Submit samples to a soil testing laboratory for lime and fertilizer recommendations.

### ***Scheduling***

The schedule for work at the site should consider the recommended planting period and whenever practical the site work should accommodate seeding during the recommended planting period.

### ***Seedbed Preparation***

Grade and loosen the soil to a smooth firm surface to enhance rooting of seedlings and reduce rill erosion. Break up large clods and loosen compacted, hard or crusted soil surfaces with a disk, ripper, chisel, harrow or other tillage equipment. Avoid preparing the seedbed under excessively wet conditions to minimize compaction. Operate the equipment on the contour.

For either broadcast seeding or drill seeding, the tillage, as a minimum, should adequately loosen the soil to a depth of at least 6", alleviate compaction, and smooth and firm the soil for the proper placement of seed.

For no-till drilling, the soil surface should not be loosened unless the site has surface compaction and if compaction exists, special care with soil loosening will be needed to retain the desired residue on the soil surface.

Incorporate lime and fertilizer to a depth of at least 6" with a disk or rotary tiller on slopes of up to 3:1. On steeper slopes, lime and fertilizer may be applied to the surface without incorporation. Lime and fertilizer may be applied through hydroseeding equipment; however, fertilizer should not be added to the seed mixture during hydroseeding. Liming materials such as liquid lime may be added with the seed mixture.

### ***Liming***

Follow the design plan or soil test recommendation. If a plan or soil test is not available, use 2 tons/acre of ground agricultural lime on clayey soils (approximately 90 lbs/acre) and 1 ton/acre on sandy soils (approximately 45 lbs/acre). Exception to situation without a design or a soil test: If the cover is tall fescue and clover, use 2 tons of agricultural lime (approximately 135 lbs/1000 ft<sup>2</sup>) on both clayey and sandy soils.

Spread the specified amount of lime and incorporate into the top 6" of soil after applying fertilizer.

### **Fertilizing**

Apply a complete fertilizer at rates specified in the design plan or as recommended by soil tests. In the absence of soil tests, use the following as a guide:

#### **Grass Alone**

Use 8-24-24 or equivalent – apply 400 lbs/acre (approximately 9 lbs/1000 ft<sup>2</sup>) starting. When vegetation has emerged to a stand and is growing, 30 lbs/acre (approximately 0.8 lbs/10000 ft<sup>2</sup>) of additional nitrogen fertilizer should be applied.

#### **Grass-Legume Mixture**

Use 5-10-10 or equivalent – apply 800 - 1200 lbs/acre (approximately 18 - 27 lbs/1000 ft<sup>2</sup>).

#### **Legume Alone**

Use 0-20-20 or equivalent – apply 400 - 600 lbs/acre (approximately 9 - 14 lbs/1000 ft<sup>2</sup>) at planting.

*Note: Fertilizer can be blended to meet exact fertilizer recommendations. Take soil test recommendations to local fertilizer dealer for bulk fertilizer blends. This may be more economical than bagged fertilizer.*

### **Planting**

Plant the species specified in the plan at the rate and depth specified. In the absence of plans and specifications, plant species and seeding rates may be selected by qualified persons using Figure PS-1 and Table PS-1.

Apply seed uniformly using a cyclone seeder, drop-type spreader, drill, cultipacker seeder or hydroseeder.

When using a drill seeder, plant grasses and legumes ¼” to ½” deep. Calibrate equipment in the field.

When planting by methods other than a drill seeder, cover seed by raking, or dragging a chain, brush or mat. Then firm the soil lightly with a roller. Seed can also be covered with hydro-mulched wood fiber and tackifier. Legumes require inoculation with nitrogen-fixing bacteria to ensure good growth. Purchase inoculum specific for the seed and mix with seed prior to planting.



Figure PS-1 Geographical Areas for Species Adaptation

*Note: Site conditions related to soils and aspect in counties adjacent to or close to county boundaries may justify adjustments in adaptable areas by qualified design professionals.*

### **Mulching**

Mulching is extremely important for successful seeding. Whether the mulching material is straw or a manufactured product, the material needs to be applied properly. Uniformly spread organic mulches by hand or with a mulch blower at a rate which provides about 75% ground cover. Spread HECs utilizing appropriate equipment and at rates as specified in the plan or by the manufacturer. Caution, an over-application of wheat straw will reduce stand success – do not over-apply wheat straw when mulching a seeding! (See Mulching practice for more details).

Table PS-1 Commonly used Plants for Permanent Cover with Seeding Rates and Dates

Species	Seeding Rates/Ac PLS	North	Central	South
Seeding Dates				
<b>Bahiagrass, Pensacola</b>	40 lbs	--	Mar 1-Jul y 1	Feb 1-Nov 1
<b>Bermudagrass, Common</b>	10 lbs	Apr 1-July 1	Mar 15-July 15	Mar 1-July 15
<b>Bahiagrass, Pensacola</b> <b>Bermudagrass, Common</b>	30 lbs 5 lbs	--	Mar 1-July 1	Mar 1-July 15
<b>Bermudagrass, Hybrid (Lawn Types)</b>	Solid Sod	Anytime	Anytime	Anytime
<b>Bermudagrass, Hybrid (Lawn Types)</b>	Sprigs 1/sq ft	Mar 1-Aug 1	Mar 1-Aug 1	Feb 15 - Sep 1
<b>Fescue, Tall</b>	40-50 lbs	Sep 1-Nov 1	Sep 1-Nov 1	--
<b>Sericea</b>	40-60 lbs	Mar 15-July 15	Mar 1-July 15	Feb 15 -July 15
<b>Sericea &amp; Common Bermudagrass</b>	40 lbs 10 lbs	Mar 15 -July 15	Mar 1-July 15	Feb 15-July 15
<b>Switchgrass, Alamo</b>	4 lbs	Apr 1-Jun 15	Mar 15-Jun 15	Mar 15-June 15

PLS means pure live seed and is used to adjust seeding rates. For example, to plant 10 lbs PLS of a species with germination of 80% and purity of 90%,  $PLS = 0.8 \times 0.9 = 72\%$ . 10 lbs PLS =  $10 / 0.72 = 13.9$  lbs of the species to be planted.

### Hydroseeding

Surface roughening is particularly important when hydroseeding, as roughened slope will provide some natural coverage for lime, fertilizer, and seed. The surface should not be compacted or smooth. Smooth seedbed preparation is not necessary for hydroseeding operations; large clods, stones, and irregularities provide cavities in which seeds can lodge.

Mix seed, inoculant if required, and a seed carrier with water and apply as a slurry uniformly over the area to be treated. The seed carrier should be a cellulose fiber, natural wood fiber or cane fiber mulch material which is dyed an appropriate color to facilitate uniform application of seed. Use the correct legume inoculant at 4 times the recommended rate when adding inoculant to a hydroseeder slurry. The mixture should be applied within one hour after mixing to reduce damage to seed.

Fertilizer should not be mixed with the seed-inoculant mixture because fertilizer salts may damage seed and reduce germination and seedling vigor.

Fertilizer may be applied with a hydroseeder as a separate operation after seedlings are established.

Agricultural lime is usually applied as a separate operation and spread in dry form. It is not normally applied with a hydraulic seeder because it is abrasive and, also, may clog the system. On the other hand, liquid lime is applied with a hydraulic seeder but because of cost is used primarily to provide quick action for benefit of plants during their seedling stage with the bulk of liming needs to be provided by agricultural lime. Dry lime may be applied with the fertilizer mixture.

### ***Installation Verification***

Check materials and installation for compliance with specifications during installation of products.

## **Common Problems**

*Consult with a qualified design professional if the following occurs:*

- Design specifications for seed variety, seeding dates or mulching cannot be met; substitutions may be required. Unapproved substitutions could lead to failure.
- Seeding at the wrong time of the year results in an inadequate stand. Reseed according to specifications of a qualified design professional (see recommendations under Maintenance)
- Inadequate mulching results in an inadequate stand, bare spots or eroded areas-prepare seedbed, reseed, cover seed evenly and tack or tie down mulch, especially on slopes, ridges and in channels (see recommendations under Maintenance).

## **Maintenance**

Generally, a stand of vegetation cannot be determined to be fully established until vegetative cover has been maintained for 1 year from planting.

### ***Reseeding***

Inspect seedlings monthly for stand survival and vigor. Also, inspect the site for erosion.

If stand is inadequate identify the cause of failure (choice of plant materials, lime and fertilizer quantities, poor seedbed preparation or weather) and take corrective action. If vegetation fails to grow, have the soil tested to determine whether pH is in the correct range or nutrient deficiency is a problem.

Stand conditions, particularly the coverage, will determine the extent of remedial actions such as seedbed preparation and reseeding. A qualified design professional should be consulted to advise on remedial actions. Consider drill seeding where possible.

Eroded areas should be addressed appropriately by filling and/or smoothing, and reapplication of lime, fertilizer, seed and mulch.

### ***Fertilizing***

Satisfactory establishment may require fertilizing the stand in the second growing season. Follow soil test recommendations or the specifications provided to establish and maintain the planting. After the second year, fertilizing is often needed annually or periodically to maintain a healthy stand and cover sufficient for erosion control.

### ***Mowing***

Mow vegetation on structural practices such as embankments and grass-lined channels to prevent woody plants from invading.

Other areas should be mowed to compliment the use of the site.

Certain species can be weakened by mowing regimes that significantly reduce their food reserves stored for the next growing season: fescue should not be mowed close during the summer; sericea should not be mowed close in late summer.

Bermudagrass and bahiagrass are tolerant of most mowing regimes and can be mowed often and close, if so desired, during their growing season.

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## Preservation of Vegetation (PV)



### Practice Description

Preservation of vegetation is the avoidance of an area during land disturbing and construction activity to prevent mechanical and other injury to desirable plants in the planned landscape. The practice provides erosion and sediment control and is applicable where vegetative cover is desired and the existing plant community is compatible with the planned landscape.

### Typical Components of the Practice

- Mark Plant Area for Retention
- Plant Protection
- Treating Damaged Plants
- Verification of Practice

### Installation

Preservation requirements should be designed by a qualified design professional and plans should be made available to field personnel prior to start of construction

### ***Mark Plant Area for Retention***

Clearly indicate the areas to be avoided by marking with tape (flagging), barricade netting or other appropriate means.

### ***Plant Protection***

Protect plants that are identified for preservation from compaction by equipment, cutting and filling operations, trenching, and tunneling.

### ***Treating Damaged Plants***

Treat damaged trees and shrubs as soon after damage as practical. Treatment may include shaping a wound for proper healing, pruning of jagged roots, pruning of damaged limbs and fertilization to enhance growth.

### ***Verification of Practice***

Check to determine that specifications are met as the areas are identified for retention, as the plants are protected during construction and that damaged plants are treated or replaced.

## **Common Problems**

*Consult with a qualified design professional if any of the following occur:*

- Soil compaction appears to be retarding plant growth or affecting plant health.
- Damage to plants appears to be severe and life threatening.
- Plants appear of poor quality and are undesirable for retention.

*Problems during construction that require remedial actions:*

- Erosion – eroded areas should be vegetated to grass or a suitable ground cover.
- Severely damaged trees, shrubs or vines should be replaced.

## **Maintenance**

Enhance and maintain plant growth and health according to the maintenance plan. This may involve applying fertilizer, spreading mulch and pruning trees and shrubs.

Replace dead plants as needed to maintain desired landscape cover. Additional information about plantings is found in the following practices: Permanent Seeding: Shrub, Vine and Groundcover Planting: and Tree Planting on Disturbed Areas.

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## Retaining Wall (RW)



### Practice Description

A retaining wall is a constructed wall used to eliminate steep slopes between areas that have abrupt changes in grade. This practice is used to replace cut or fill slopes in confined areas or where a wall is necessary to achieve stable slopes. A retaining wall can be constructed of reinforced concrete, treated timbers, gabions, reinforced earth (a system of face panels and buried reinforcement strips), or other manufactured products such as interlocking concrete blocks.

### Typical Components of the Practice

- Site Preparation
- Grading
- Foundation Preparation
- Installation of Wall
- Drain Installation
- Backfill Installation
- Erosion Control
- Construction Verification

## **Construction**

Prior to the start of construction, a qualified design professional should design and specify the construction requirements for retaining walls. Plans and specifications should be available to field personnel.

### ***Site Preparation***

At least 3 days prior to construction, contact the Alabama Line Location Center (dial 811) to identify, locate and mark all underground utilities within the project area.

Clear installation area of debris and obstacles, such as tree and stumps, that might hinder grading and installation of the wall.

### ***Grading***

Grade existing embankments according to the design plan to provide a stable slope until construction of the retaining wall is complete.

Grade the top of the embankments according to the design plan to direct stormwater runoff around the area where retaining walls are being constructed.

### ***Foundation Preparation***

Prepare the foundation for the retaining wall in accordance with the design plans.

### ***Installation of Wall***

#### **Concrete Wall Installation**

The placement of reinforcing steel, the construction of forms, concrete batching, mixing, placement, curing, and finishing should be in accordance with the project specifications and the American Concrete Institute (ACI) standards. The concrete mix quantities, air entrainment, slump, temperature, and compressive strength should be in accordance with the plans for the job.

Compressive strength of the concrete should be verified by laboratory tests on representative cylinders made during concrete placement.

Drains and weep holes should be installed as shown on the design plans.

#### **Modular Block Wall Installation**

Prepare a leveling pad of compacted, crushed rock (typically 6" thick and 18" wide). Place the first row of modular blocks on the leveling pad (not a footing, as the geosynthetic reinforcement will bear the weight of the block and the backfill). Install additional modular blocks and geosynthetic reinforcement (geogrid or geotextile) according to design plans.

### Timber Wall Installation

Timbers should be new pressure-treated (usually 0.6 pcf for ground contact) members having a design life consistent with that of the project and free of splits and deep cracks.

Proper tiebacks are essential to the stability of timber retaining walls. Install tiebacks according to design plans.

### Manufactured Products Installation

Specifications for manufactured products should be provided by the manufacturer or in the design plan. Inspect all such materials for damage prior to installation.

### Drain Installation

Install drains as specified in the design plans.

### Backfill Installation

Backfill for all wall types should be placed carefully in layers not exceeding 8" (loose) and compacted with hand-operated tampers. The degree of compaction should be provided as specified in the design plans. Before compacting, the soil should be moistened or dried as necessary to obtain the optimum moisture content specified. Backfill should not be placed on surfaces that are muddy, frozen or contain frost or ice.

Backfill for retaining walls built of manufactured products such as reinforced earth or interlocking concrete blocks should be placed according to manufacturer's recommendations. Tiebacks or geosynthetic reinforcements should be placed as specified in the design plans.

Nonwoven geotextile fabric should be used behind timber or modular block walls to help keep soil in place.

### ***Erosion Control***

Stabilize all bare areas according to the vegetation plan.

### ***Safety***

Steep slopes are subject to collapse and can be a safety hazard to persons in the area. No person should work adjacent to steep slopes without shoring protection or properly sloping the embankment.

### **Construction Verification**

Check finished retaining wall for conformance with design plans and specifications.

Check for cracks or movement of the retaining wall.

### **Common Problems**

*Consult with a qualified design professional if any of the following occur:*

- Variations in topography on site indicate retaining wall will not function as intended.
- Seepage is encountered during construction. It may be necessary to install drains.
- Poor foundation soils are encountered under the proposed wall location.
- Design specifications for concrete, timbers, backfill or other materials cannot be met; substitutions may be required. Unapproved substitutions could lead to failure.
- High soil and water pressures result in structural failure of the wall—consult qualified design professional and rebuild according to revised plan and specifications.

### **Maintenance**

Inspect retaining walls periodically and after heavy rains for cracks, undercutting of the foundation, piping erosion, wetness or movement.

Repair problems determined during inspections. Repair cracks according to manufacturer's recommendations.



## Shrub, Vine and Groundcover Planting (SVG)



### Practice Description

Shrub, vine and groundcover planting is establishing shrubs, vines or groundcover to stabilize landscapes where establishing grass is difficult and mowing is not feasible. The practice is especially suited for steep slopes where aesthetics are important. Incidental benefits include providing food and shelter for wildlife, windbreaks or screens and improved aesthetics.

### Typical Components of the Practice

- Site Preparation
- Soil Amendments (lime and fertilizer)
- Planting
- Mulching
- Watering
- Inspection

### Installation

Shrub, vine and groundcover planting requirements should be designed by a qualified design professional and plans and specifications should be made available to field personnel prior to start of planting.

### **Site Preparation**

Sites should be prepared in strips along the contour or by individual spots. Site preparation may include contour tilling or the digging of individual holes. Site preparation will vary according to type of plant.

On steep slopes, till the soil in contour rows or dig single holes for each plant. Blend the needed lime, fertilizer, and organic material with the soil removed from each hole or furrow. Mix fertilizer thoroughly with the soil before planting, and use it sparingly to avoid burning roots. To eliminate harmful competition from weeds, an appropriate pre-emergent herbicide may be useful if weeding is not practical.

### **Soil Amendments (lime and fertilizer)**

Plantings of shrubs, vines and groundcovers may need applications of fertilizer and lime. Amendments should be applied according to the site plan or by soil test recommendations. In the absence of a plan or soil test recommendations, apply agricultural limestone into the top 6" of soil at the rate of 50 lbs. of agricultural limestone and 25 lbs. of 8-8-8 per 1000 ft<sup>2</sup> for group plantings of groundcovers and vines. For individual shrub plantings apply ½ pound of lime and ¼ pound of 8-8-8 per individual hole. Soils low in organic matter may be improved by incorporating organic matter in the form of peat, compost, aged sawdust or well-rotted manure.

### **Planting**

In the absence of a site-specific planting plan consider the following guidelines.

#### **Shrubs**

Late winter (before leaves emerge) is the best time for planting deciduous shrubs and early fall is the best for evergreens. Shrubs grown and marketed in containers can be planted anytime during the year except when the ground is frozen.

#### **Individual Shrubs**

Provide as large an area as possible for initial root development. The hole should be dug to a depth that allows the root ball to extend 1" above the soil surface, and should be as big around as 3 to 5 times the diameter of the root ball.

#### **Shrubs in Prepared Beds**

Bed preparation differs somewhat from planting in individual holes. Bed areas are usually tilled or spaded, typically to a depth of 8" to 12". Contrary to the individual planting, soil amendments, such as peat or compost at a rate of 1 part amendment to 3 parts native soil, are beneficial to shrubs because they provide a uniform root environment across the bed area. This type of soil amendment also enables plants to respond positively to water and fertilizers when they are applied. The hole for the shrub planted in a bed area should be a few inches wider in diameter than the root ball.

### Container Plants

Remove container plants from their containers, cutting the container if necessary. If the plant is root-bound (roots circling the outside of the root ball), score the roots from top to bottom about 4 times, cutting about ¼" deep with a knife, or gently massage the root ball until roots point outward. Place the shrub into the hole. Using only the native backfill, add soil back to the hole until it is ½ to ¾ full. Add water to the backfill soil around the root ball. Add soil to ground level and thoroughly water again. A small dike may be formed around the edge of the planting hole to hold water around the root ball if in sandy soils or on slopes.

*Caution: In a tight clay soil, plants may be adversely affected by wetness caused by the clay soil trapping additional water in the root zone.*

### Bare Root Plants

Soak roots in water. When planting, spread the roots in the hole and gradually add soil. Firm the soil, being careful to avoid breaking roots. Fill the hole with water, and allow it to drain. Then fill the hole with soil, and water again thoroughly.

### Burlapped Plants

Cut any wire or string around the plants' stems. Do not remove the burlap. Fold the burlap back so it will be buried by soil. Burlap which is allowed to remain exposed after planting can act as a wick, causing the root ball to dry out. From this point, follow the same procedure for filling the hole as that described for container plants.

### Vines and Groundcovers

Early fall or early spring is the best time to plant vines and ground covers.

Transplanting to the prepared seedbed can be done using a small trowel or a spade. Make a hole large enough to accommodate the roots and soil. Backfill and firm the soil around the plant, water immediately, and keep well watered until established. Water slowly and over long periods to allow for infiltration and reduce runoff.

*Note: Most groundcovers are planted from container-grown nursery stock. Planting density determines how quickly full cover is achieved; one foot spacing is often used for rapid cover. Large plants such as junipers can be spaced on 3-foot centers.*

### **Mulching**

Apply mulch according to the site plan for the project. On slopes where erosion may be a problem and a plan is not available consider the following guidelines.

Use a thick durable mulch such as shredded bark (not chips) or pine straw. On steep slopes, install erosion control netting or matting prior to planting, and tuck plants into the soil through slits in the net. Plant using a staggered pattern.

### **Watering**

#### **Shrubs**

Water shrubs immediately after planting and keep well watered for the first few weeks. Apply water weekly if rainfall does not supply 1” of water per week. Be conscious of plants that have been in the ground for less than 1 year and water them regularly and thoroughly during extended dry periods.

#### **Vines and Groundcover**

Water vines and groundcover immediately after planting and keep well watered until established. Vines and groundcover need about an inch of water a week for the first 2 years after planting.

### **Verification of Practice**

Check all components of the practice during installation to ensure that specifications are being met.

### **Common Problems**

*Consult with a qualified design professional if any of the following occur:*

- Soil compaction at planting time appears so significant that it will prevent adequate plant growth. Compaction should be addressed during site preparation.
- Design specifications for plants (species, variety, planting dates) and mulch cannot be met. Unapproved substitutions could lead to failure.

*Problems that require remedial actions:*

- Erosion, washout and poor plant establishment – repair eroded surface, replant, reapply mulch and anchor.
- Mulch is lost to wind or stormwater runoffs – reapply mulch and anchor.

### **Maintenance**

Replant shrubs, vines or groundcovers where needed to maintain adequate cover for erosion control. Repair eroded surfaces by reapplying the previous treatment

and determine if an additional practice is needed, .i.e. installing erosion netting. Maintain shrubs, vines and ground covers with applications of fertilizer and mulching. Reapply mulch that is lost to wind, stormwater runoff or decomposition.

Shrubs, vines and groundcovers need about an inch of water a week for the first 2 years after planting. When rain does not supply this need, shrubs should be watered deeply not less than once a week.

Fertilization needs should be determined by a professional because different plants have different needs. In the absence of a recommendation from a landscape professional, a soil test is the best way to determine what nutrient elements are needed. Fertilizer formulations of 12-4-8 or 15-0-15 can be used in the absence of a soil test. Apply 2 lbs of fertilizer per 1000 ft<sup>2</sup> of area.

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## Sodding (SOD)



### Practice Description

Sodding is the use of a transplanted vegetative cover to provide immediate erosion control in disturbed areas. Sodding is well suited for stabilizing erodible areas such as grass-lined channels, slopes around storm drain inlets and outlets, diversions, swales, and slopes and filter strips that cannot be established by seed or that need immediate cover.

### Typical Components of the Practice

- Plant Selection
- Surface Preparation
- Soil Amendments (lime and fertilizer)
- Installing the Sod
- Irrigation
- Installation Verification

### Installation

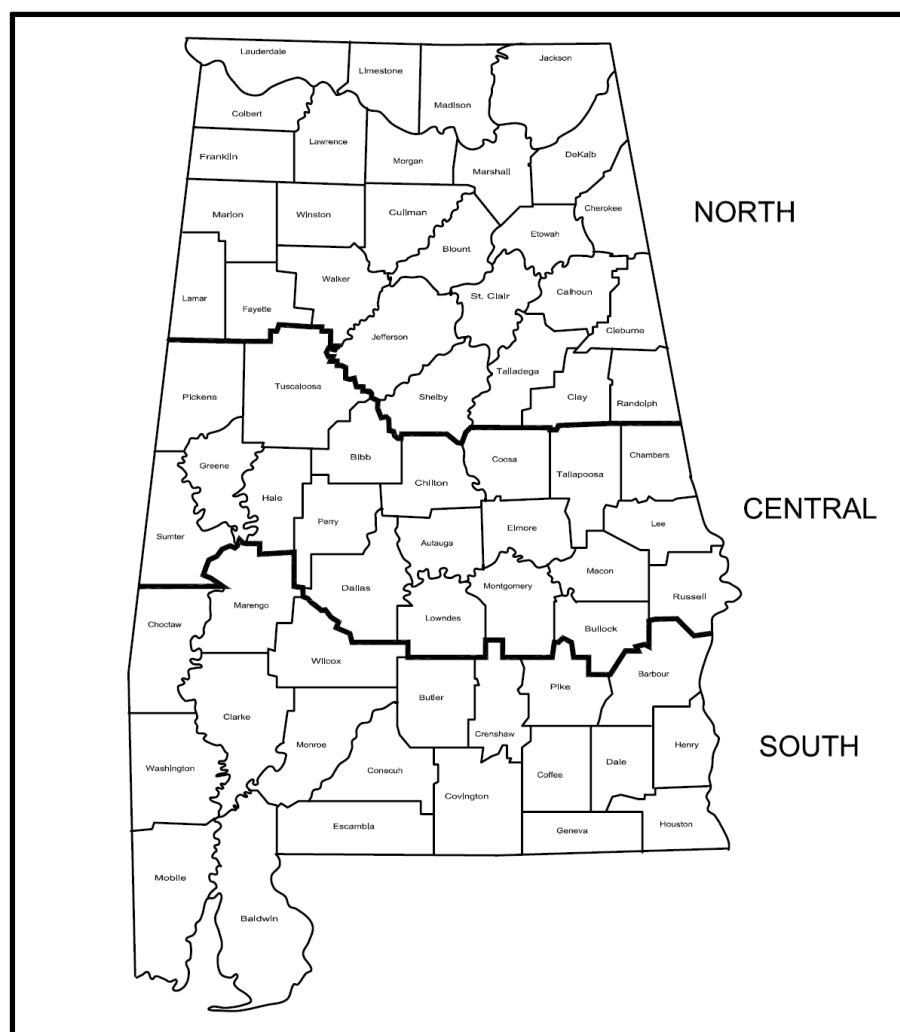
Prior to start of installation, Typical Components of the Practice should be specified by a qualified design professional. Plans and specifications should be referred to by field personnel throughout the installation process.

Failure to remove compaction and to address pH and soil fertility deficiencies will likely cause a sodded stand to perform poorly or fail.

### Plant Selection

Use plants specified in plan. If not specified, select a variety using Figure SOD-1 and Tables SOD-1 and SOD-2.

Figure SOD-1 Geographical Areas for Species Adaptation



*Note: Site conditions related to soils and aspect in counties adjacent to or close to county boundaries may justify adjustments in adaptable areas by qualified design professionals.*



Table SOD-1 Grasses Adapted for Sodding in Alabama

Warm Season Species	Variety	Area Adapted
Bermudagrass	Tifway, TifSport, Celebration, TifGrand, Common	North, Central, South
Bahiagrass	Pensacola	Central, South
Centipede	Common, TifBlair	Central, South
St. Augustine	Common, and a few commercial varieties	South
Zoysia	Any selection available in Alabama, Zenith is seeded	Central, South
<b>Cool Season Species</b>		
Tall Fescue	Kentucky 31, Rebel (turf type)	North

Table SOD-2 Adaptation and Maintenance of Grasses Used for Sodding

Species	Tolerance Ratings					Maintenance	
	Shade	Heat	Cold	Drought	Wear	Mowing Height	Mowing Frequency
Bermudagrass	No	Good	Poor	Excel.	Excel.	1"	High
Bahiagrass	Fair	Good	Poor	Excel.	Good	2-3"	High
Centipede	Fair	Good	Poor	Good	Poor	1 ½"	Low
Tall Fescue	Good	Fair	Good	Good	Good	3"	High
St. Augustine	Good	Good	Poor	Poor	Poor	2-3"	Medium
Zoysia	Fair	Good	Fair	Excel.	Good	1"	High

### **Surface Preparation**

Clear the area of clods, rocks, etc. and smooth the area. Grade and loosen the soil to a smooth firm surface to enhance rooting. Break up large clods and loosen compacted, hard or crusted soil surfaces with a disk, ripper, chisel, harrow or other tillage equipment. Avoid preparing the seedbed under excessively wet conditions. Operate the equipment on the contour.

Where topsoiling is specified, additional steps will be done based on the design plan or, if not available, according to the Topsoiling practice.

### **Application of Soil Amendments**

Apply fertilizer and lime according to the plan or by soil test recommendations. In the absence of a plan or soil test recommendations apply agricultural limestone

at the rate of 2 tons per acre (90 lbs. per 1000 sq. ft.) and 10-10-10 fertilizer at the rate of 1000 lbs. per acre (25 lbs per 1000 ft.<sup>2</sup>) Apply ground agricultural limestone unless a soil test shows a pH of 6.0 or greater. Incorporate amendments to depth of 4" to 6" with a disk or rotary tiller.

Rake or harrow to achieve a smooth, final grade on which to lay the sod. Surface should be loose, and free of plants, trash and other debris.

During high temperatures, moisten the soil immediately prior to laying sod. This cools the soil and reduces root burning and dieback.

### ***Installing the Sod***

Lay the first row of sod in a straight line with subsequent rows placed parallel to and butting tightly against each other. Stagger joints to create a brick-like pattern and promote more uniform growth and strength. Ensure that sod is not stretched or overlapped and that all joints are butted tight to prevent spaces which would cause drying of the roots (See Figure SOD-2).

On slopes 3:1 or steeper, or wherever concentrated flow may be a problem, lay sod with staggered joints and secure by stapling or pegging. Install sod with the length perpendicular to the water flow (on the contour). See Figure SOD-3. Staple firmly at the corners and middle of each strip. Jute or synthetic netting may be pegged over the sod for further protection against washout during establishment.

### ***Irrigation***

Immediately after laying the sod, roll or tamp it to provide firm contact between roots and soil, then irrigate sod deeply so that the underside of the sod pad and the soil 6" below the sod is thoroughly wet.

Until a good root system develops, water sod during dry periods as often as necessary to maintain moist soil to a depth of at least 4".

### ***Construction Verification***

Check materials and installation for compliance with specifications.

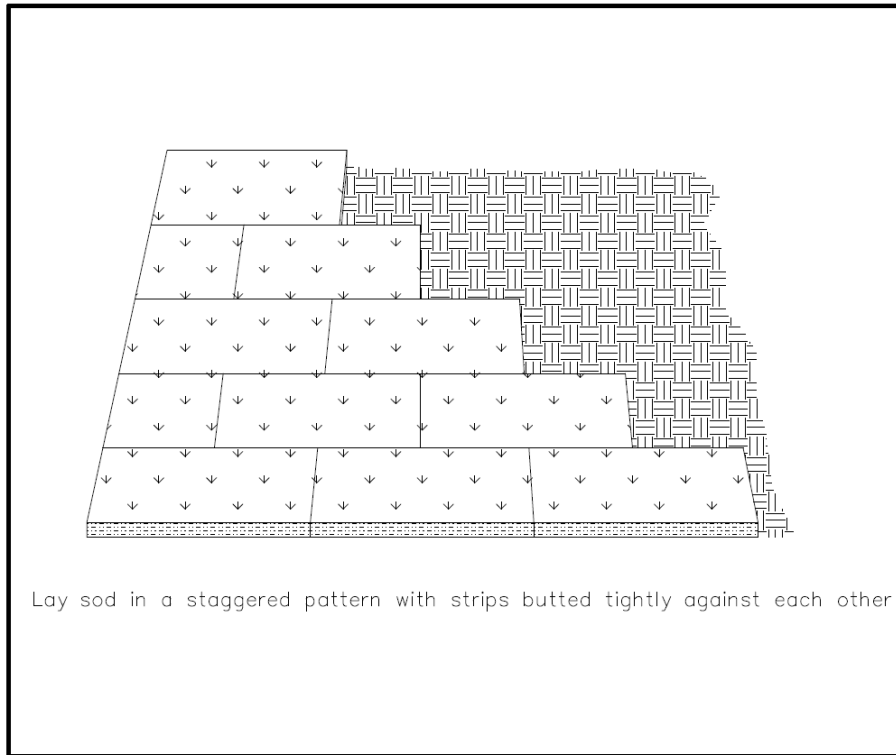


Figure SOD-2 Typical Installation of Grass Sod

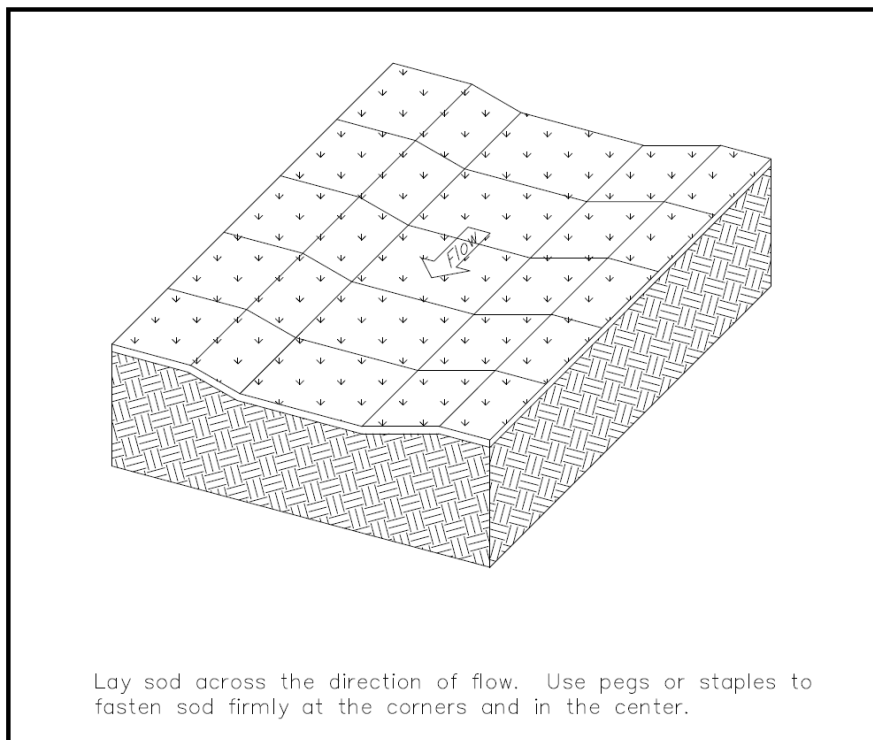


Figure SOD-3 Installation of Sod in Waterways

## Common Problems

*Consult with a qualified design professional if any of the following occur:*

- Variations in topography on site indicate the sodding materials will not function as intended; changes in plan may be needed.
- Design specifications for sod variety cannot be met or irrigation is not possible; substitution or seeding may be required. Unapproved substitutions could result in erosion or sodding failure.
- Sod laid on poorly prepared soil or unsuitable surface and grass dies because it is unable to develop a root system with the soil: remove dead sod, prepare surface properly and resod.
- Sod not adequately irrigated after installation; may cause root dieback or grass does not root rapidly and is subject to drying out: irrigate sod and underlying soil to a depth of 4" and keep moist until roots are established.
- Sod not anchored properly may be loosened by runoff: use guidance under Site Preparation to repair the damaged areas, lay healthy sod, anchor properly and irrigate as planned.
- Slow growth due to lack of nitrogen: apply additional fertilizer.

## Maintenance

Keep sod moist until it is fully rooted.

Mow to a height of 2" to 3" after sod is well-rooted, frequently in 2 to 3 weeks. Do not remove more than  $\frac{1}{3}$  of the leaf blade in any mowing.

Permanent, fine turf areas require yearly fertilization. Fertilize warm-season grass in late spring to early summer; fertilize cool-season grass in early fall and late winter. Fertilize at rates recommended by a soil test.

## Temporary Seeding (TS)



### Practice Description

Temporary seeding is the establishment of fast-growing annual vegetation from seed on disturbed areas. Temporary vegetation provides economical erosion control for up to a year and reduces the amount of sediment moving off the site.

This practice applies where short-lived vegetation can be established before final grading or in a season not suitable for planting the desired permanent species. It helps prevent costly maintenance operations on other practices such as sediment basins and sediment barriers. In addition, it reduces problems of mud and dust production from bare soil surfaces during construction. Temporary or permanent seeding is necessary to protect earthen structures such as dikes, diversions, grass-lined channels and the banks and dams of sediment basins.

### Typical Components of the Practice

- Scheduling
- Seedbed Preparation
- Applying Soil Amendments (fertilizer and lime)
- Planting
- Mulching or Installation of Erosion Control Blanket
- Inspection

## **Installation**

Prior to start of installation, plant materials, seeding rates and planting dates should be specified by a qualified design professional. Plans and specifications should be referred to by field personnel throughout the installation process.

Plantings should be made during the specified planting period if possible. When sites become available to plant outside of the recommended planting period, either a temporary seeding, mulching or chemical stabilization should be applied. If lime and fertilizer application rates are not specified, take soil samples during final grading from the top 6" in each area to be seeded. Submit samples to a soil testing laboratory for lime and fertilizer recommendations.

### ***Seedbed Preparation***

Grade and loosen soil to a smooth firm surface to enhance rooting of seedlings and reduce rill erosion. If compaction exists, loosen the surface to 6" to 8". Break up large clods and loosen compacted, hard or crusted soil surfaces with a disk, ripper, chisel, harrow or other tillage equipment. Avoid preparing the seedbed under excessively wet conditions to minimize soil compaction. Operate the equipment on the contour.

For either broadcast seeding or drill seeding, loosen the soil to a depth of at least 6".

For no-till drilling, the soil surface does not need to be loosened unless the site has surface compaction. If shallow compaction exists, the area should be chiseled across the slope at least 6". If compaction exists between 6" and 12" the area should be chiseled or subsoiled at least 12".

Lime and fertilizer should be incorporated during seedbed preparation.

### ***Applying Soil Amendments***

#### **Liming**

Follow the design plan or soil test recommendation. If a plan or soil test is not available, use 2 tons/acre of ground agricultural lime on clayey soils (approximately 90 lbs/1,000 ft<sup>2</sup>.) and 1 ton/acre on sandy soils (approximately 45 lbs/ft<sup>2</sup>.).

Spread the specified amount of lime and incorporate into the upper 6" of soil following seedbed preparation and applying fertilizer.

Agricultural lime is usually applied as a separate operation and spread in dry form. It is not normally applied with a hydraulic seeder because it is abrasive and, also, may clog the system. On the other hand, liquid lime is applied with a hydraulic seeder but because of cost, liquid lime is used primarily to provide quick action for benefit of plants during their seedling stage with the bulk of

liming needs to be provided by agricultural lime. Dry lime may be applied with the fertilizer mixture.

### Fertilizing

Apply a complete fertilizer at rates specified in the design plan or as recommended by soil tests. In the absence of soil tests, use the following as a guide:

8-24-24 or equivalent – apply 400 lbs/acre (approximately 9 lbs/1000 ft<sup>2</sup>) at planting.

When vegetation has emerged to a stand and is growing, 30 to 40 lbs/acre (approximately 0.8 lbs/1000 ft<sup>2</sup>) of additional nitrogen fertilizer should be applied.

*Note: Fertilizer can be blended to meet exact fertilizer recommendations. Take soil test recommendations to local fertilizer dealer for bulk fertilizer blends. This may be more economical than bagged fertilizer.*

Incorporate lime and fertilizer to a depth of at least 6” with a disk or rotary tiller on slopes of up to 3:1.

On steeper slopes, lime and fertilizer may be applied to the surface without incorporation. Lime and fertilizer may be applied together; however, fertilizer should not be added to the seed mixture during hydroseeding. Lime may be added with the seed mixture.

### Planting

Plant the species specified in the plan at the rate and depth specified. In the absence of plans and specifications, plant species and seeding rates may be selected by qualified persons from Table TS-1.

Apply seed uniformly using a cyclone seeder, drop-type spreader, drill, drill seeder, cultipacker seeder or by hand on a fresh, firm friable seedbed.

When using a drill seeder, plant seed ¼” to ½” deep. Calibrate equipment in the field.

When planting by methods other than a drill seeder or hydroseeder, cover seed by raking, or dragging a chain, brush or mat. Then firm the soil lightly with a roller. Seed can also be covered with a hydromulch product.

Cover broadcast seed by raking or chain dragging; then firm the surface with a roller or cultipacker to provide good seed contact. Small grains should be planted no more than 1” deep and grasses and legume seed no more than ½” deep.

## TS-1 Commonly Used Plants for Temporary Cover

Species	Seeding Rate/Ac PLS	North  Seeding Dates	Central	South
Millet, Browntop or German	40 lbs	May 1-Aug 1	Apr 1-Aug 15	Apr 1-Aug 15
Rye	3 bu	Sept 1-Nov 15	Sept 15-Nov 15	Sept 15-Nov 15
Ryegrass	30 lbs	Aug 1-Sept 15	Sept 1-Oct 15	Sept 1 -Oct 15
Sorghum-Sudan Hybrids	40 lbs	May 1-Aug 1	Apr 15-Aug 1	Apr 1-Aug 15
Sudangrass	40 lbs	May 1-Aug 1	Apr 15-Aug 1	Apr 1-Aug 15
Wheat Common	3 bu	Sept 1-Nov 1	Sept 15-Nov 15	Sept 15-Nov 15
Common Bermudagrass	10 lbs	Apr 1-July 1	Mar 15-July 15	Mar 1-July 15
Crimson Clover	10 lbs	Sept 1-Nov 1	Sept 1-Nov 1	Sept 1-Nov 1

*PLS means pure live seed and is used to adjust seeding rates. For example, to plant 10 lbs PLS of a species with germination of 80% and purity of 90%,  $PLS = 0.8 \times 0.9 = 72\%$ . 10 lbs PLS =  $10 / 0.72 = 13.9$  lbs of the species to be planted.*

**Hydroseeding**

Surface roughening is particularly important when hydroseeding, as roughened slope will provide some natural coverage for lime, fertilizer, and seed. The surface should not be compacted or smooth. Fine seedbed preparation is not necessary for hydroseeding operations; large clods, stones, and irregularities provide cavities in which seeds can lodge.

Mix seed, inoculant if required, and a seed carrier with water and apply as a slurry uniformly over the area to be treated. The seed carrier should be a cellulose fiber, natural wood fiber or cane fiber mulch material which is dyed an appropriate color to facilitate uniform application of seed. Use the correct legume inoculant at 4 times the recommended rate when adding inoculant to a hydroseeder slurry. The mixture should be applied within one hour after mixing to reduce damage to seed.

Fertilizer should not be mixed with the seed-inoculant mixture because fertilizer salts may damage seed and reduce germination and seedling vigor. Fertilizer may be applied with a hydroseeder as a separate operation after seedlings are established.



### **Mulching**

Mulching is extremely important for successful seeding. Whether the mulching material is straw or a manufactured product, the material needs to be applied properly. Uniformly spread organic mulches by hand or with a mulch blower at a rate which provides about 75% ground cover. Spread HECPs utilizing appropriate equipment and at rates as specified in the plan or by the manufacturer. Caution, an over-application of wheat straw will reduce stand success – do not over-apply wheat straw when mulching a seeding! (*See Mulching practice for more details*).

### **Verification of Installation**

Check materials and installation for compliance with specifications during installation of products.

### **Common Problems**

*Consult with a qualified design professional if the following occurs:*

- Design specifications for seed variety, seeding dates or mulching cannot be met; substitutions may be required. Unapproved substitutions could lead to failure.
- Seeding outside of the recommended results in an inadequate stand. Reseed according to specifications of a qualified design professional (see recommendations under Maintenance).

### **Maintenance**

#### **Reseeding**

Inspect seedings weekly until a stand is established and thereafter at least monthly for stand survival and vigor. Also, inspect the site for erosion.

Eroded areas should be addressed appropriately by filling and/or smoothing, and reapplication of lime, fertilizer, seed and mulch.

A stand should be uniform and dense for best results. Stand conditions, particularly the coverage, will determine the extent of remedial actions such as seedbed preparation and reseeding. A qualified design professional should be consulted to advise on remedial actions. Consider drill seeding when doing a remedial planting.

#### **Fertilizing**

If vegetation fails to grow, have the soil tested to determine whether pH is in the correct range or nutrient deficiency is a problem.

Satisfactory establishment may require refertilizing the stand, especially if the planting is made early in the planting season. Follow soil test recommendations or the specifications provided to establish the planting.

### ***Mowing***

Temporary plantings may be mowed and baled or simply mowed to compliment the use of the site.

Millet, sorghum-sudan hybrids, sudangrass, rye and wheat may be mowed, but no lower than 6" (closer moving may damage the stand).

Ryegrass is tolerant of most mowing regimes and may be mowed often and as close as 4" to 6" if this regime is started before it attains tall growth (over 8").

Bermudagrass is tolerant of most mowing regimes and can be mowed often and close, if so desired, during its growing season.

## Tree Planting On Disturbed Areas (TP)



### Practice Description

Tree planting on disturbed areas is planting trees on construction sites or other disturbed areas to stabilize the soil. The practice reduces erosion and minimizes the maintenance requirements after a site is stabilized. The practice is applicable to those areas where tree cover is desired and is compatible with the planned use of the area, particularly on steep slopes and adjacent to streams. Tree planting is usually used with other cover practices such as permanent seeding or sodding.

### Typical Components of the Practice

- Site Preparation
- Planting Seedlings and Trees
- Mulching
- Inspection

### Installation

Tree planting requirements should be designed by a qualified design professional and plans and specifications should be made available to field personnel prior to start of planting.

### ***Bare Root Seedlings***

#### Site Preparation

Compacted soil should be ripped or chiseled on the contour to permit adequate root development and proper tree growth. Debris should be removed from the site to facilitate tree planting.

#### Planting

Planting should be done in accordance with the design plan. If a detailed plan is not available, select trees that are suitable for growing on the disturbed site. Select trees that are long-lived and are not considered invasive or a nuisance. Consideration should be given to trees that are visually pleasing and will provide food and cover for wildlife.

Bare-root seedlings should be planted between December 1 and March 15 when the soil is neither too dry nor too wet. Freezing weather should be avoided.

If planting is being done on sloping land by equipment, the planting should be made on the contour.

Bare-root seedlings should be planted deeper than they grew in the nursery: small stock 1" deeper and medium to large stock ½" deeper. On most soils longleaf pine seedlings should be planted ¼" deeper than they grew in the nursery (note: this not true for planting depth of container grown longleaf seedlings – see Site Preparation in next section for container grown seedlings). Roots should be planted straight down and not twisted, balled, or U-shaped. Soil should be packed firmly around the planted seedlings.

The roots of seedlings must be kept moist and cool at all times. After lifting, seedlings should not be exposed to sun, wind, heating, drying or freezing before they are planted. Baled seedlings may be kept up to 3 weeks if they are properly stacked, watered, and kept in a cool place. When planting is delayed longer than 3 weeks, the roots of seedlings should be covered with moist soil (heeled-in) or the seedlings should be put in cold storage.

During planting, the roots of seedlings must be kept moist and only 1 seedling should be planted at a time. At the end of each day, loose seedlings should be either repacked in wet moss or heeled-in.

If specified, tree tubes and tree mats should be installed according to specifications or manufacturer's recommendations.

#### Mulching

Mulching may be necessary on sloping land to reduce erosion. Mulch with wood chips, bark, pine needles, peanut hulls etc. should be done to a depth of no more than 3". Mulch should not be placed against the trunk of a tree.

### ***Balled and Burlapped and Container-Grown Trees***

The best time to plant hardwood trees is in late winter (before leaves emerge) and the best time to plant evergreens is in early fall. However, these plants may be planted anytime of the year except when the ground is frozen. Watering is essential during dry periods.

#### **Site Preparation**

The planting hole should be dug deep and wide enough to allow proper placement of the root ball. The final level of the root ball's top should be level with the ground surface (See Figure TP-1).

As the hole is dug the topsoil should be kept separate from the subsoil. If possible the subsoil should be replaced with topsoil. If topsoil is unavailable the subsoil can be improved by mixing in  $\frac{1}{3}$  volume of peat moss or well-rotted manure.

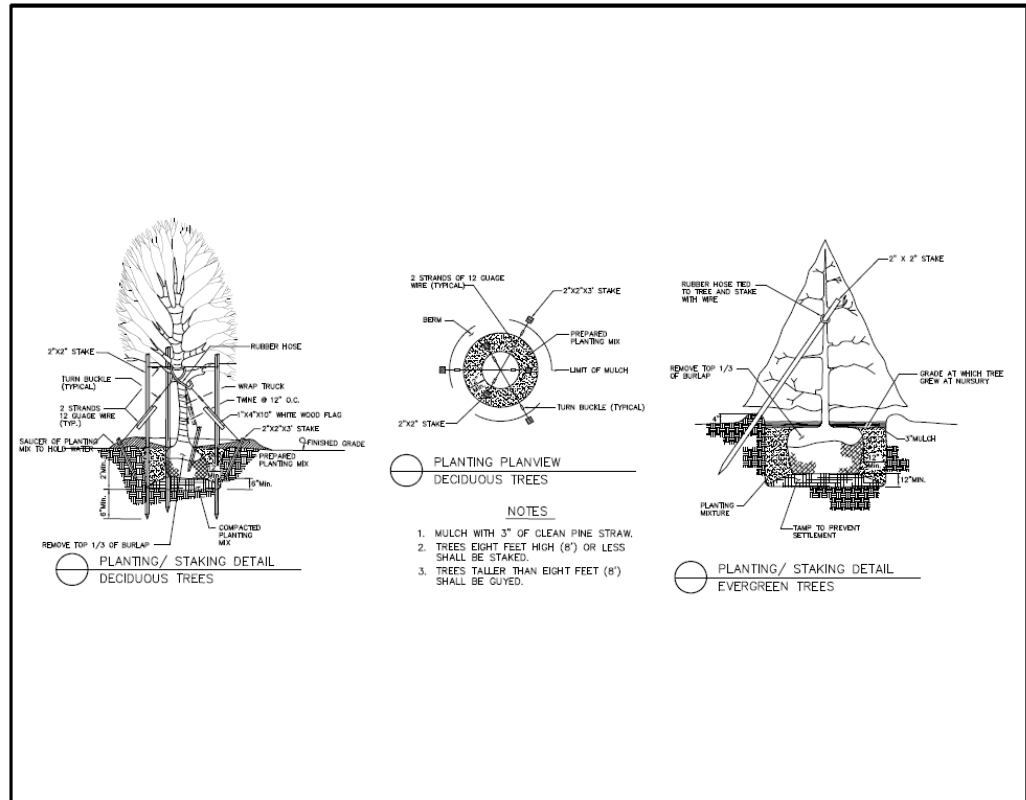


Figure TP-1 Tree Planting Diagram

#### **Planting**

Depth of planting must be close to the original depth. The tree may be set just a few inches higher than in its former location, especially if soil is poorly drained. Do not set the tree lower than before. For container grown longleaf seedlings, the planting depth should be slightly higher than the depth grown in the nursery. Soil to be placed around the root ball should be moist but not wet.

Set the tree in the hole and if the tree is balled and burlapped remove the rope which holds the burlap. Loosen the burlap and remove completely if practical. Do not break the soil of the root ball. Fill the hole with soil halfway and add water to settle the soil and eliminate air pockets. When the water has drained off, fill the hole the remainder of the way. Use extra soil to form a shallow basin around the tree. This will help retain water.

Newly planted trees may need artificial support to prevent excessive swaying. Stakes and guy wires may be used (See Figure TP-1). Guying should be loose enough to allow some movement of the tree.

### Mulching

Following planting, mulch with wood chips, bark, pine needles, peanut hulls etc. to a depth of no more than 3". Mulch should not be placed against the trunk of the tree.

Mulching may be necessary on sloping land to reduce erosion and should be used around balled and burlapped trees and container grown trees to help conserve soil moisture and reduce competition from weeds and grass.

### ***Verification of Installation***

Check all components of the practice during installation to ensure that specifications are being met.

### **Common Problems**

*Consult with a qualified design professional if any of the following occur:*

- Soil compaction can prevent adequate tree growth. Compaction should be addressed during site preparation.
- Design specifications for trees (species, planting dates) and mulch cannot be met; substitutions may be required. Unapproved substitutions could lead to failure

*Problems that require remedial actions:*

Erosion, washout and poor tree establishment – repair eroded surface, replant, reapply mulch and anchor.

Mulch is lost to wind or stormwater runoff – reapply mulch and anchor.

## **Maintenance**

Replant dead trees where needed to maintain adequate cover for erosion control.

Periodic fertilization may be beneficial on poor sites to maintain satisfactory tree growth. Transplanted trees should be fertilized 1 year or so after planting. A soil test is the best way to determine what elements are needed. Fertilizer formulations of 10-8-6 or 10-6-4 can be used in the absence of a soil test. About 2 lbs. of fertilizer should be used for each inch of tree diameter measured at 4.5 feet above the ground.

Fertilizer must come in contact with the roots to benefit a tree. The easiest way to apply fertilizer is to simply broadcast it under the tree and over the root system. As a tree grows, the roots will grow well beyond the drip line. This should be taken into account when applying fertilizer by the broadcast method. Another way to apply fertilizer is to make holes in the tree's root area with a bar or auger. Holes should be 18" deep, spaced about 2 feet apart, and located around the drip line of the tree. Distribute the fertilizer evenly into these holes and close the holes with the heel of the shoe or by filling with topsoil or peat moss. Trees should be fertilized in late winter or early spring before leaves emerge.

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